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Geographical Distribution of Sexual and Apogamous Types of *Dryopteris chinensis* (Dryopteridaceae) in Japan

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Only triploid and tetraploid apogamous cytotypes have previously been reported for the fern *Dryopteris chinensis* (Dryopteridaceae). In this paper we report the discovery of a diploid sexual cytotype of *D. chinensis*. The geographical distribution of the sexual and apogamous types of the species in Japan and adjacent region was determined by counting the number of spores per sporangium in a large number of herbarium specimens from MAK and TNS. Apogamous plants were found to be the predominant type in Japan; the sexual type was restricted to Miyazaki, Oita, and Kumamoto prefectures in Kyushu, and Kochi Prefecture in Shikoku, Japan.

Keywords: apogamy, chromosome number, Dryopteridaceae, *Dryopteris chinensis*, reproductive mode, sexual cytotype

The fern *Dryopteris chinensis* (Baker) Koidz. (Dryopteridaceae), considered to be apogamous, is widely distributed in China and Japan (Zhang 2012, Iwatsuki *et al*. 1995). Only triploid apogamous types of *D. chinensis* have been reported from Japan, whereas tetraploid apogamous plants have been reported from China (Kurita 1961, Hirabayashi 1966, 1974, Mitui 1968, Kurata & Nakaike 1985, Weng 1989, Nakato *et al*. 1995). Lee & Park (2013) recently reported apogamous *D. chinensis* from Korea, although its ploidy level was unknown. To the best of our knowledge, sexual plants of *D. chinensis* have never been reported. Previous cytological studies were based on plants collected from only a few localities or areas throughout its range.

In China, *Dryopteris chinensis* occurs in Anhui, Guangxi, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shandong, and Zhejiang provinces (Zhang 2012). Weng (1989) reported triploid apogamous plants of *D. chinensis* from Lushan in Jiangxi Province, and Nakato *et al*. (1995) reported triploid and tetraploid apogamous *D. chinensis* from Jiangsu Province. In Japan, triploid apogamous plants were reported from Saitama and Shizuoka prefectures, Honshu (Kurita 1961, Hirabayashi 1966, Mitui 1968, Hirabayashi 1974), but *D. chinensis* is also widely distributed in Honshu, Shikoku, and Kyushu. We therefore suspected that sexual cytotypes might occur.

During this study we discovered diploid sexual plants of *Dryopteris chinensis* in Miyazaki Prefecture, Kyushu, Japan, and also updated the distribution of sexual and apogamous types of *D. chinensis* in Japan, mainly by counting the number of spores per sporangium in herbarium specimens.

Materials and Methods

Plant Materials

One living stock and 19 leaf samples of *Dryopteris chinensis* were collected in eight localities in Miyazaki Prefecture, Japan, on June 18–20, 2013, and in one locality in Kumamoto Prefecture, Japan, on March 26, 2013.

Cytological observation and determination of reproductive mode

Root tips were pretreated with 0.004 M 8-hydroxyquinoline for 6 h at approximately 17–20°C to observe mitotic chromosomes. After fixation in ethanol and acetic acid (3:1) for 15–30 min, the root tips were hydrolyzed in 1 N HCl at 60°C for 1–3 min and squashed in 2% aceto-orcein solution. The chromosomes were then observed under a Nikon OPTIPHOT microscope and photographed with a Panasonic LUMIX DMC-TZ5 digital camera.

To determine the reproductive mode of each sample, the spores in one sporangium were counted. If the number was 64, we determined the sample to be sexually reproducing; if 32, then we determined the sample to be apogamous (Manton 1950).

Ploidy analyses

Methods of ploidy analyses using flow cytometry followed Hori *et al.* (2014). To determine the ploidy level, the DNA content (2C value) of each nucleus extracted from fresh pinnae was measured by flow cytometry using a Cyflow Ploidy Analyzer PA-II (Partec, Munster, Germany) and a Cystain UV Precise P kit (Partec). Approximately 100 mm^2 of each pinna was torn into several pieces and finely chopped with a razor blade in 0.25 mL of nucleus extraction buffer from the kit. Then, 0.8 mL of staining solution from the kit was added to the chopped tissues. The crushed tissue and buffers were filtered through a 30-µm nylon mesh (Partec). Fresh leaf tissues of *Nicotiana tabacum* L. (approximately 25 mm^2) and *Dryopteris erythrosora* (D. C. Eaton) Kuntze (approximately 100 mm^2) were used as internal standards. The preliminary analysis revealed that the nuclear DNA content peaks of *D. chinensis* and *N. tabacum* overlapped on the ploidy analyzer. We therefore determined the genome size of *D. erythrosora* by using *N. tabacum* as an internal standard, then used *D. erythrosora* as the reference to estimate the genome size of *D. chinensis*.

Identification of reproductive mode of herbarium specimens

Four hundred and seventy six specimens retaining unburst sporangia from approximately 2,000 sheets of *Dryopteris chinensis* in the her-

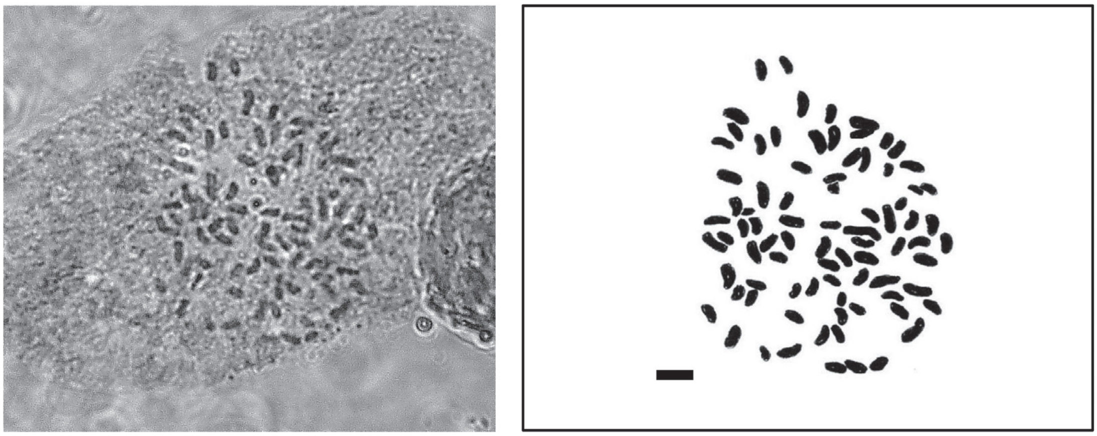

FIG. 1. Photograph (left) and schematic drawing (right) of mitotic metaphase chromosomes of a diploid sexual individual of *Dryopteris chinensis* (*K. Hori Dpaci 856-2*, MAK 412500). Scale bar, 5 µm.

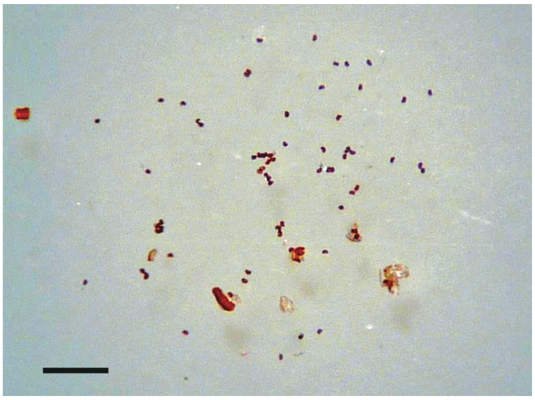

FIG. 2. Spores in a sporangium of a diploid sexual individual of *Dryopteris chinensis* (*K. Hori Dpaci 856-2*, MAK 412500). Scale bar, 1 mm.

barium of the National Museum of Nature and Science (TNS) and the Makino Herbarium of Tokyo Metropolitan University (MAK) were selected to determine the reproductive mode. The number of spores per sporangium was counted under a stereomicroscope. The type of reproduction, apogamous or sexual, was determined in the same way as for the living samples.

Results

Ploidy and reproductive mode

Figure 1 shows a photograph and a diagrammatic drawing of mitotic metaphase chromosomes in one individual of *Dryopteris chinensis* (*K. Hori Dpaci 856-2*, MAK 412500). Based on the chromosome number of $2n = 82$ and 64 spores per sporangium (Fig. 2), we determined this sample to be diploid and sexual.

The genome the diploid sexual individual of *Dryopteris chinensis* was 0.50 times the internal standard of *D. erythrosora*, while *D. erythrosora* was 2.26 times that of *Nicotiana tabacum* in our ploidy analyses. Considering that the genome size (2C value) of *N. tabacum* is approximately 11.7 pg (Narayan 1987), the genome size of *D. chinensis* (*K. Hori Dpaci 856-2*, MAK 412500) is estimated to be approximately 13.2 pg. Among 19 leaf samples collected in 2013, all except one had 64 spores per sporangium, and were thus estimated to be sexual reproducing. The genome size of 15 sexual plants were determined to be 12.5–14.5

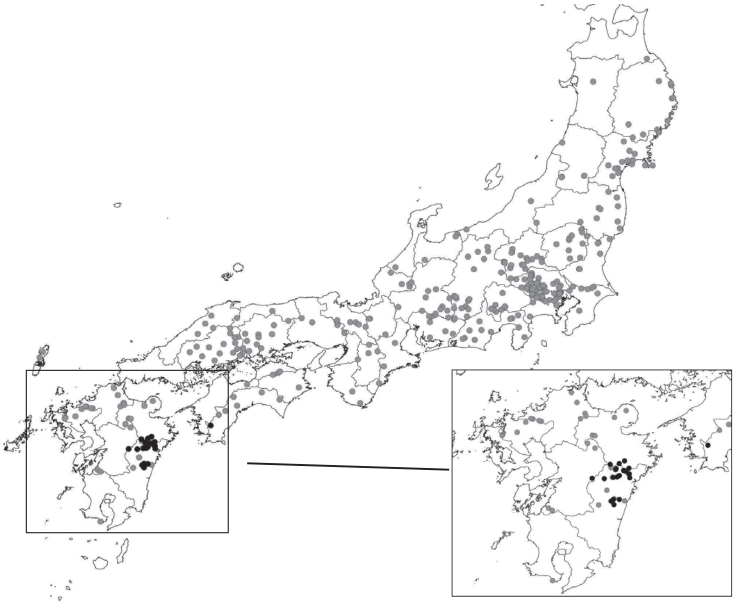

FIG. 3. Distribution of apogamous and sexual types of *Dryopteris chinensis* based on spore counts of herbarium specimens. Black circle, sexual type; gray circle, apogamous type.

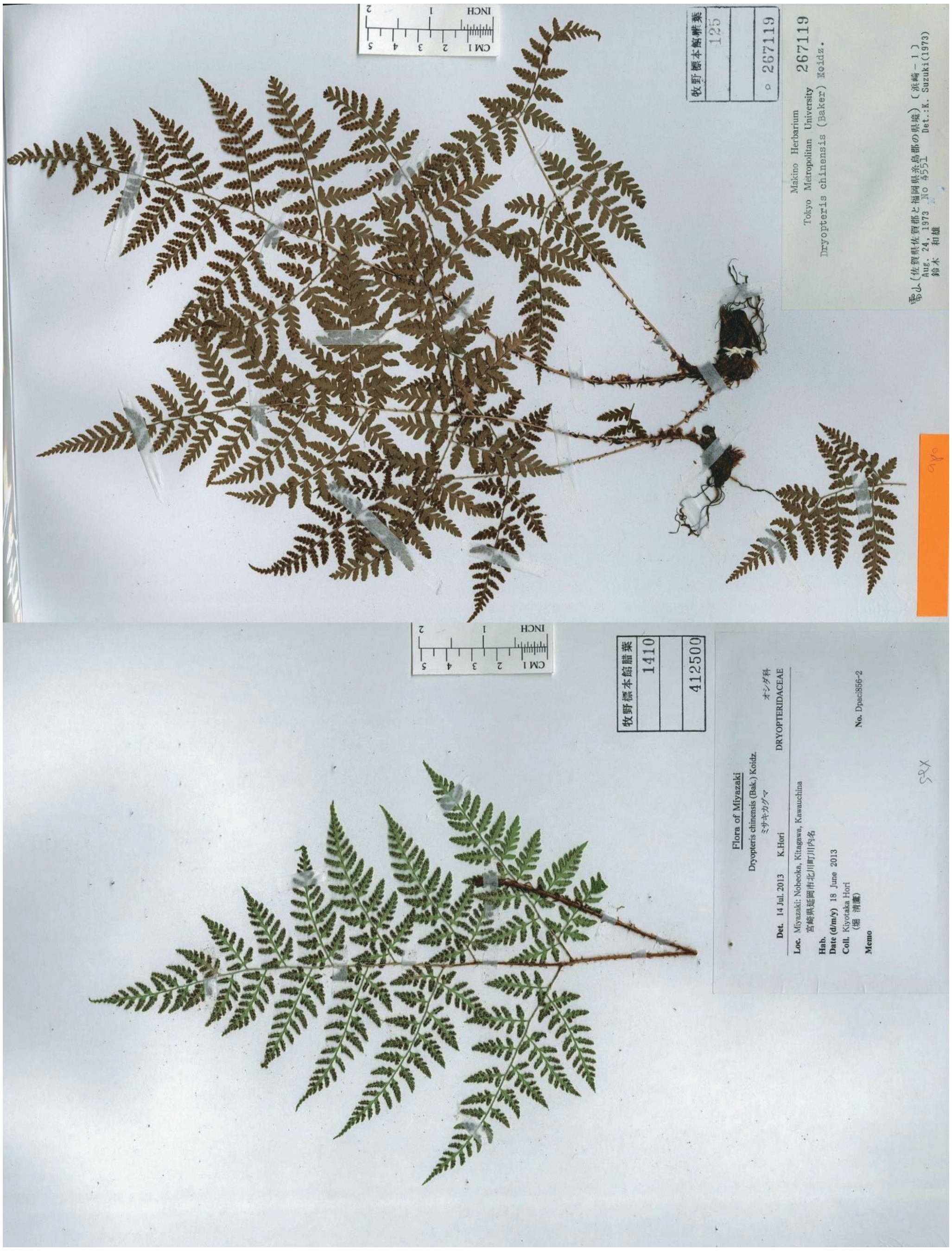

FIG. 4. Gross morphology of diploid sexual *Dryopteris chinensis* from Miyazaki Prefecture (A, MAK 412500), and apogamous *D. chinensis* from Fukuoka Prefecture (B, MAK 267119). Scale bar, 5 cm.

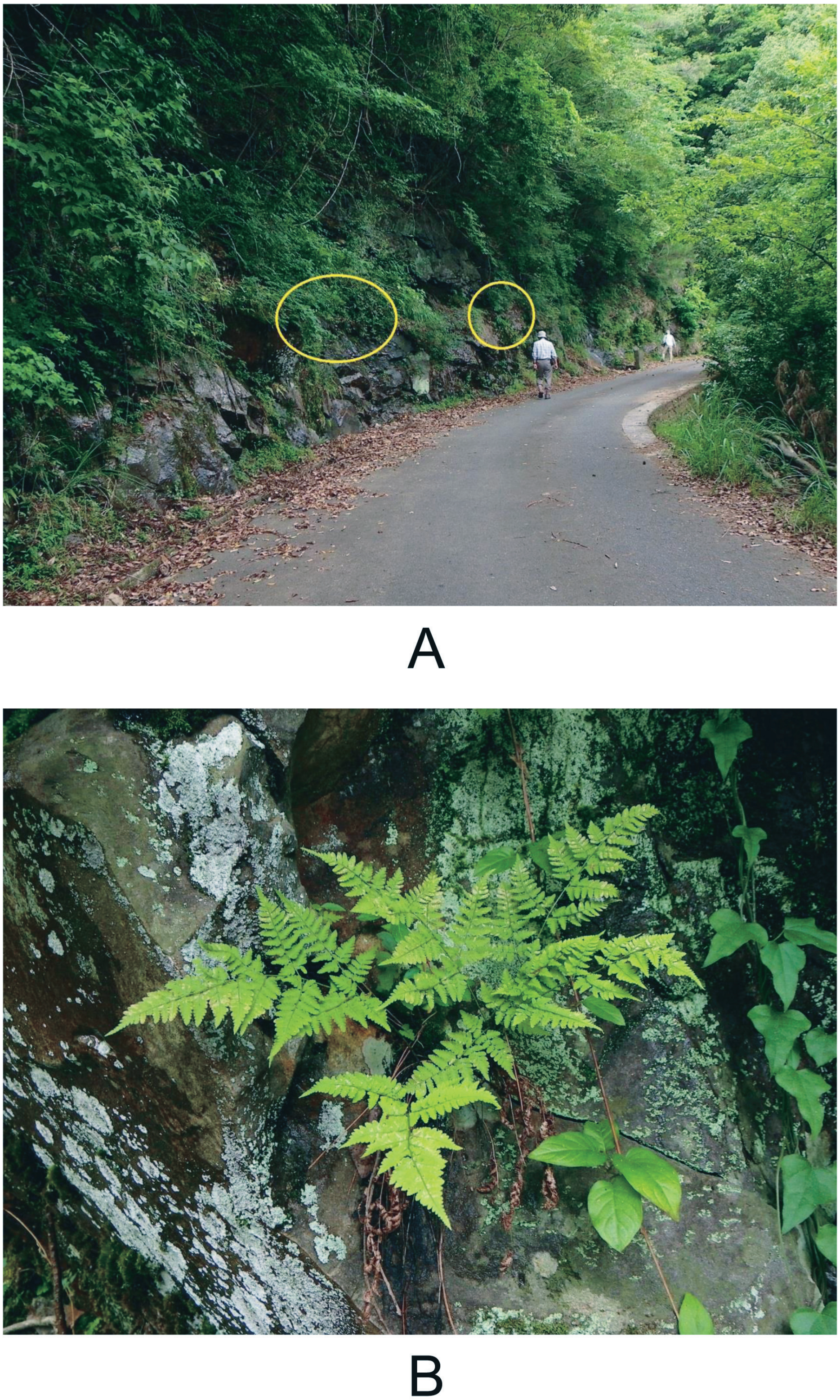

FIG. 5. Habitat of diploid sexual *Dryopteris chinensis* in Kitagawa-cho, Nobeoka-shi, Miyazaki Prefecture (*K. Hori Dpaci 856-2*, MAK 412500). A, Semi shade under trees beside a highway; B, Sexual *D. chinensis* on cracked rock.

pg (Appendix 1), which is exactly the same in the diploid *Dpaci 856-2* (13.2 pg) [*K. Hori Dpaci 816* (MAK 410320) ~ *Dpaci 860* (MAK 410359)]. We estimated one individual of *Dryopteris chinensis* [*K. Hori Dpaci 813* (MAK 410317)] with 32 spores per sporangium and a genome size of 19.5 pg to be triploid and apogamous.

Reproductive mode of herbarium specimens

Spore number per sporangium was determined for 476 sheets of selected specimens. Among them, 39 specimens had 64 spores per sporangium and 437 specimens had 32 spores per sporangium (Appendix 1). We were unable to count the spores of the remaining specimens.

Based on the source of the specimens, the distribution of the sexual and apogamous types of *Dryopteris chinensis* in Japan are shown in Fig. 3. We noticed no significant morphological differences between the apogamous and sexual cytotypes (Fig. 4).

Habitats of the sexual diploid Dryopteris chinensis

The diploid sexual individuals of *Dryopteris chinensis* were from cracked rocks in semi shade under trees beside highways (Fig.5). The apogamous individuals were often in similar habitats, but mixed sexual and apogamous populations were not found.

Discussion

We report for the first time diploid sexual individuals of *Dryopteris chinensis* from southern Miyazaki Prefecture, Japan. Based on the number of spores per sporangium in herbarium specimens, we determined that sexual *D. chinensis* also occurs in western Kochi Prefecture, southeastern Kumamoto Prefecture, southern Oita Prefecture, and northern Miyazaki Prefecture (Fig. 3). Sexual *D. chinensis* appears to be distributed in a narrow area in southwestern Japan, while apogamous individuals are widely distributed in Japan (Fig. 3). Within the distribution area of the sexual *D. chinensis* are also such rare ferns as *Asplenium ensiforme* Wall. ex Hook.et Grev. and *Deparia minamitanii* Serizawa (Iwatsuki et al. 1995).

In angiosperms, asexually reproducing cytotypes usually have a wider and more northern distribution than their sexual relatives and has been referred to as “geographical parthenogenesis” (Hörandl 2006). This phenomenon has not been well documented in ferns, but the apogamous *Asplenium unilaterale* has been reported to occur in more northern areas (Murakami & Iwatsuki 1983). *Dryopteris caudipinna* (a diploid sexual species) occurs in more southern areas than *D. erythrosora*, a triploid apogamous species closely related to *D. caudipinna* (Yamamoto *et al*. 2010). The results of our study suggest that geographical parthenogenesis is common also in ferns.

In the present study, diploid sexual *Dryopteris chinensis* was observed to occur only near the southern limit of distribution of the apogamous type in Japan. *D. chinensis* is also in China, where the sexual type may be more widely distributed. A wider survey, including plants from China, is recommended.

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APPENDIX 1. Reproductive modes, ploidies and voucher information of the examined specimens.

sex/ apo	DNA amounts (pg.)	Ploidy level	Locality			Date	Year	Coll.	Specimen no.		
			Country	County, Prefecture	Towns, villages, mountains				TNS	MAK	Personal no.
sex			Japan	Kochi Pref.	Hata-gunn, Nishitosa-mura, Kurosonn river	Jul. 29	1980	K. Yamaoka	451251		
sex			Japan	Kumamoto Pref.	Kamimashiki-gunn, Seiwa-mura, Daikannyama	Aug. 12	1984	T. Kariyazaki	1205795		1784
sex			Japan	Kumamoto Pref.	Yatsushiro-shi, Izumi-machi, Shiibaru	Mar. 26	2013	Y. Inoue		410386	
sex			Japan	Miyazaki Pref.	Nobeokashi, Hasekawauchi	Sep. 12	1982	T. Minamitani	592038		32761
sex			Japan	Miyazaki Pref.	Nishiusuki-gunn,Hinokage-cho, Mitate	Nov. 23	1982	T. Yoshida	592039		
sex			Japan	Miyazaki Pref.	Nishiusuki-gunn,Hinokage-cho, Kamikage	Oct. 15	1982	T. Minamitani	592042		33357
sex			Japan	Miyazaki Pref.	Nobeoka-shi, Tae	Sep. 12	1982	T. Minamitani	448820		32754
sex			Japan	Miyazaki Pref.	Koyu-gunn, Kijo-cho, Kobudokoro	Sep. 5	1982	T. Minamitani	NA		32423
sex			Japan	Miyazaki Pref.	Koyu-gunn, Kijo-cho, Ishikawachi	Feb. 14	1964	I. Taki	213478		
sex			Japan	Miyazaki Pref.	Nobeoka-shi, Houri river- Mt. Okue	Aug. 16	1960	S.Hatsushima		51414	
sex			Japan	Miyazaki Pref.	Nobeoka-shi, Houri river- Mt. Okue	Aug. 16	1960	S.Hatsushima		51415	
sex	13.0	2x	Japan	Miyazaki Pref.	Nobeoka-shi, Kitakata-cho, Shimoshishigawa	Jun. 19	2013	K. Hori		410320	Dpaci816
sex	13.9	2x	Japan	Miyazaki Pref.	Nishiusuki-gunn,Hinokage-machi, Mitate	Jun. 19	2013	K. Hori		410321	Dpaci817
sex	14.5	2x	Japan	Miyazaki Pref.	Nobeoka-shi, Hori-river	Jun. 18	2013	K. Hori		410342	Dpaci843
sex	13.7	2x	Japan	Miyazaki Pref.	Nobeoka-shi, Hori-river	Jun. 18	2013	K. Hori		410343	Dpaci844
sex	12.5	2x	Japan	Miyazaki Pref.	Nobeoka-shi, Kitakata-cho, Sugebaru	Jun. 19	2013	K. Hori		410347	Dpaci848
sex	13.5	2x	Japan	Miyazaki Pref.	Nobeoka-shi, Kitakata-cho, Sugebaru	Jun. 19	2013	K. Hori		410348	Dpaci849
sex	12.7	2x	Japan	Miyazaki Pref.	Nobeoka-shi, Kitakata-cho, Sugebaru	Jun. 19	2013	K. Hori		410349	Dpaci850
sex	13.6	2x	Japan	Miyazaki Pref.	Nobeoka-shi, Kitakata-cho, Sugebaru	Jun. 19	2013	K. Hori		410350	Dpaci851
sex	12.9	2x	Japan	Miyazaki Pref.	Nobeoka-shi, Kitakata-cho, Sugebaru	Jun. 19	2013	K. Hori		410352	Dpaci853
sex	14.5	2x	Japan	Miyazaki Pref.	Nobeoka-shi, Kitagawa-cho, Kawachimyo	Jun. 18	2013	K. Hori		410353	Dpaci854
sex	13.2	2x	Japan	Miyazaki Pref.	Nobeoka-shi, Kitagawa-cho, Kawachimyo	Jun. 18	2013	K. Hori		410354	Dpaci855
sex			Japan	Miyazaki Pref.	Nobeoka-shi, Kitagawa-cho, Kawachimyo	Jun. 18	2013	K. Hori		410355	Dpaci856
sex	13.2	2x(2n=82)	Japan	Miyazaki Pref.	Nobeoka-shi, Kitagawa-cho, Kawachimyo	Jun. 18	2013	K. Hori		412500	Dpaci856-2
sex	13.6	2x	Japan	Miyazaki Pref.	Hyuuga-shi, Togo-cho, Shimosannge	Jun. 20	2013	K. Hori		410356	Dpaci857
sex	13.5	2x	Japan	Miyazaki Pref.	Hyuuga-shi, Togo-cho, Shimosannge	Jun. 20	2013	K. Hori		410357	Dpaci858
sex	14.0	2x	Japan	Miyazaki Pref.	Hyuuga-shi, Togo-cho, Shimosannge	Jun. 20	2013	K. Hori		410358	Dpaci859
sex	13.6	2x	Japan	Miyazaki Pref.	Hyuuga-shi, Togo-cho, Shimosannge	Jun. 20	2013	K. Hori		410359	Dpaci860
sex			Japan	Miyazaki Pref.	Nobeoka-shi, Kitagawa-cho, Kawachimyo	Jun. 18	2013	K. Hori		412498	Dpaci881
sex			Japan	Miyazaki Pref.	Nobeoka-shi, Kitakata-cho, Sugebaru	Jun. 19	2013	K. Hori		412501	Dpaci882
sex			Japan	Miyazaki Pref.	Higashiusuki-gunn, Morotsuka-mura, Iiboshi pass	Nov. 10	1996	K. Akagi		410363	
sex			Japan	Miyazaki Pref.	Higashiusuki-gunn, Morotsuka-mura, Iiboshi pass	Nov. 10	1996	K. Akagi		410364	
sex			Japan	Miyazaki Pref.	Higashiusuki-gunn, Morotsuka-mura, Iiboshi pass	Nov. 10	1996	K. Akagi		410365	
sex			Japan	Miyazaki Pref.	Higashiusuki-gunn, Morotsuka-mura, Iiboshi pass	Nov. 10	1996	K. Akagi		410366	
sex			Japan	Miyazaki Pref.	Hyuuga-shi, Togo-cho, Ishinami river	Nov. 5	2005	K. Akagi		410367	
sex			Japan	Miyazaki Pref.	Nobeoka-shi, Mt. Okue	Jul. 29	2006	K. Akagi		410368	
sex			Japan	Oita Pref.	Ono-gunn, Ogata-machi, Mt. Katabuki	Jul. 31	1962	M. Hadano	1205796		
sex			Japan	Oita Pref.	Ono-gunn, Ogata-machi, Mt. Sobo	Aug.	1955	M. Hadano	1205798		
sex			Japan	Oita Pref.	Ono-gunn, Mie-machi, Hakusanumezu pass	Jul. 30	1977	M. Hadano	1205797		
apo			Japan	Aichi Pref.	Seto-shi, Kamihadagawa	Aug. 28	1980	M. Muramatsu	550495		
apo			Japan	Aichi Pref.	Inuyama-shi, Tsugao	Jul. 13	1980	M. Fukuhara	550501		7898
apo			Japan	Aichi Pref.	Nishio-shi, Hirahara-cho	Oct. 17	1982	K. Inukai	550505		5687
apo			Japan	Aichi Pref.	Higashikamo-gunn, Asuke-cho, Otaga	Aug. 12	1978	M. Fukuhara	550507		7052
apo			Japan	Aichi Pref.	Minamishitara-gunn, Horai-cho	Jul. 24	1983	K. Inukai	582589		6112
apo			Japan	Aichi Pref.	Toyota-shi, Obata-cho	Aug. 15	1978	K. Inukai	582591		1258
apo			Japan	Aichi Pref.	Minamishitara-gunn, Tsukude-mura	Aug. 3	1983	K. Inukai	582588		6152
apo			Japan	Aichi Pref.	Seto-shi, Joko-ji	Dec. 1	1974	I. Awata	815316		
apo			Japan	Aichi Pref.	Minamishitara-gunn, Horai-cho	Jul. 22	1975	H. Miyazaki	815319		
apo			Japan	Akita Pref.	Kitaakita-gunn, Ani-machi	Oct. 7	1981	M. Hatakeyama	476377		
apo			Japan	Aomori Pref.	Hachinohe-shi, Nanngo-ku, Aotsukuri	Aug. 24	2006	M. Neichi	1204957		
apo			Japan	Chiba Pref.	Ichihara-shi, Kayahashi	Oct. 23	1983	K. Nakamura	447713		
apo			Japan	Chiba Pref.	Katori-gunn, Shimousa-machi, Nagi	Aug. 16	1981	K. Ito	538832		

APPENDIX 1. Continued.

sex/ apo	DNA amounts (pg.)	Ploidy level	Locality			Date	Year	Coll.	Specimen no.		
			Country	County, Prefecture	Towns, villages, mountains				TNS	MAK	Personal no.
apo			Japan	Chiba Pref.	Katori-gunn, Shimousa-machi, Nagoya	Aug. 16	1981	Y. Koike	538838		
apo			Japan	Chiba Pref.	Choshi-shi, Ichibushindenn	Nov. 2	1980	M. Aida	538836		
apo			Japan	Chiba Pref.	Innba-gunn, Sakae-machi	Oct. 26	1980	M. Aida	538835		
apo			Japan	Chiba Pref.	Motono-mura, Arano	Nov. 6	1977	Y. Kimizuka	538951		
apo			Japan	Chiba Pref.	Katori-gunn, Takomachi, Takodani	Jul. 27	1976	Y. Koike	538834		
apo			Japan	Chiba Pref.	Matsudo-shi		1909	T. Makino		111283	
apo			Japan	Chiba Pref.	Inzai-machi	Sep. 8	1907	T. Makino		289461	
apo			Japan	Chiba Pref.	Kashiwa-shi	Aug. 24	1966	K. Suzuki		262232	
apo			Korea	Chungcheongbuk-do	Yeongdong-gun, Mt. Cheontae-san	Aug. 13	2006	HJ. Choi		372816	
apo			Japan	Ehime Pref.	Kamiukena-gunn, Yanadani-mura	Sep. 14	1986	M. Hyodo	1204949		
apo			Japan	Ehime Pref.	Uma-gunn, Doi-machi, Mt. Akahoshi	Sep. 27	1981	M. Hyodo	557880		
apo			Japan	Ehime Pref.	Hiyoshi-mura, Mt. Jizo	Oct. 10	1982	M. Hyodo	557874		
apo			Japan	Fukui Pref.	Oono-gunn, Izumi-mura	Sep. 21	1980	Y. Saito	496394		
apo			Japan	Fukui Pref.	Oono-gunn, Izumi-mura	Jun. 13	1976	Y. Saito	496395		
apo			Japan	Fukui Pref.	Oono-gunn, Izumi-mura	Aug. 6	1976	Y. Saito	496396		
apo			Japan	Fukui Pref.	Oono-shi	Aug.	1974	Y. Saito	496397		
apo			Japan	Fukui Pref.	Sakai-gunn, Maruoka-cho, Kamitakeda	Sep. 4	1986	Y. Yoshimura	01165694		
apo			Japan	Fukuoka Pref.	Tagawa-gunn, Soeda-machi, Mt. Hidehiko	Jul. 20	1975	S. Kobayashi	557365		3835
apo			Japan	Fukuoka Pref.	Tsukiage-gunn, Tsuiki-machi, Fusada	Aug. 24	1975	S. Kobayashi	557366		3988
apo			Japan	Fukuoka Pref.	Buzenn-shi, Mt. Inugatake	Sep. 15	1969	S. Tsutsui	557368		6704
apo			Japan	Fukuoka Pref.	Fukuoka-shi, Sawara-ku, Mt. Sefuri	Sep. 1	1968	S. Tsutsui	557373		6158
apo			Japan	Fukuoka Pref.	Fukuoka-shi, Sawara-ku, Mt, Ryoshiiwa	Oct. 15	1967	S. Tsutsui	557374		4982
apo			Japan	Fukuoka Pref.	Tagawa-gunn, Kawara-machi, Ajimi pass	Jun. 14	1981	T.Shibata	557376		2788
apo			Japan	Fukuoka Pref.	Kitakyushu-shi, Yahatahigashi-ku, Mt. Sarakura	Jun. 27	1982	S. Tsutsui	592521		22812
apo			Japan	Fukushima Pref.	Iwaki-shi, Mt, Futatsuya	Aug. 21	1977	M. Yasu	571549		
apo			Japan	Fukushima Pref.	Ishikawa-gunn, Asakawa-machi	Oct. 3	1980	A. Baba	571554		
apo			Japan	Fukushima Pref.	Shirakawa-shi, Hatajuku-machi	Nov. 2	1982	Z. kaneda	438753		
apo			Japan	Fukushima Pref.	Date-gunn, Ryozan-machi	Jul. 20	1980	Z. kaneda	450854		
apo			Japan	Fukushima Pref.	Minamiaizu-gunn, Tadami-maci	Sep. 5	1980	Z. kaneda	450852		
apo			Japan	Fukushima Pref.	Tamura-gunn, Miharu-machi	Jul. 23	1979	Z. kaneda	450849		
apo			Japan	Fukushima Pref.	Tamura-gunn, Miharu-machi	Jul. 23	1979	Z. kaneda	450848		
apo			Japan	Fukushima Pref.	Sukagawa-shi, Tanukimori	Oct. 9	1983	T. Okubo	478638		
apo			Japan	Fukushima Pref.	Minamiaizu-gunn, Tadami-maci, Oshimadamu	Aug. 16	1993	K. Hasunuma	478637		
apo			Japan	Fukushima Pref.	Hara-machi, Shintagawa valley	Jul. 8	1978	T. Waku	451001		
apo			Japan	Fukushima Pref.	Futaba-gunn, Namie-machi	Dec. 6	1979	T. Waku	451000		
apo			Japan	Fukushima Pref.	Nishishirakawa-gunn, Koseki-mura	Aug. 12	1928	N. Imai	35382		
apo			Japan	Fukushima Pref.	Iwaki-gunn, Nakayama	Sep.	1910	T. Makino		110515	
apo			Japan	Fukushima Pref.	Nishishirakawa-gunn, Takisawashiramori	Sep. 23	1915	N. Imai		121799	
apo			Japan	Gifu Pref.	Nakatsugawa-shi, Kawakami	Aug. 7	1984	K. Inukai	1204950		7149
apo			Japan	Gifu Pref.	Ena-gunn, Kamiyahagi-cho, Yahagi-river	Sep. 23	1984	T. Hagiyama	1204947		5452
apo			Japan	Gifu Pref.	Toki-dhi, Dachi-cho, Hida-river	Aug. 22	1978	Y. Yamamoto	1204940		
apo			Japan	Gifu Pref.	Mashita-gunn, Gero-cho, Kadowasashinndenn	Jul. 28	1979	Y. Yamamoto	1204939		
apo			Japan	Gifu Pref.	Mashita-gunn, Kanayama-cho, Okukanayama	Sep. 26	1978	Y. Yamamoto	1204938		
apo			Japan	Gifu Pref.	Kamo-gunn, Shirakawa-cho, Kirii	Oct. 11	1981	Y. Yamamoto	1204937		
apo			Japan	Gifu Pref.	Gujo-gunn, Hachiman-cho, Onabi	Sep. 18	1983	N. Nimura	444801		
apo			Japan	Gifu Pref.	Mashita-gunn, Hagiwara-cho, Nishiueda	Oct. 1	1983	N. Nimura	444803		
apo			Japan	Gifu Pref.	Mugi-gunn, Mugi-machi, Nakanoho, Hokujo pass	Oct. 10	1983	N. Nimura	444885		
apo			Japan	Gifu Pref.	Ena-shi, Kusumi	Nov. 13	1983	K. Inukai	445987		
apo			Japan	Gifu Pref.	Nakatsugawa-shi, Agi	Nov. 6	1983	K. Inukai	445986		
apo			Japan	Gifu Pref.	Yoshiki-gunn, Ko-machi, Imamura	Oct. 5	1983	H. Nagase	445985		
apo			Japan	Gifu Pref.	Gujo-gunn, Wara-cho, Kakura	Jul. 24	1983	N. Nimura	444880		
apo			Japan	Gifu Pref.	Ena-shi, Takenami	Sep. 21	1975	H. Miyazaki	815318		
apo			Japan	Gifu Pref.	Ibi-gunn, Kasuga-mura, Furuya	Aug. 11	1906	T. Makino		114410	
apo			Japan	Gunnma Pref.	Usui-gunn, Matsuida-cho, Uramyogi	Aug. 7	1984	A. Yamamoto	1204951		
apo			Japan	Gunnma Pref.	Seta-gunn, Kurohone-mura, Kamikayama	Sep. 25	1984	S. Waku	1204946		
apo			Japan	Gunnma Pref.	Azuma-gunn, Nakanojo-machi, Kamisawatari	Oct. 22	1985	S. Waku	1204943		
apo			Japan	Gunnma Pref.	Ogo-machi, Negoya	Nov. 4	1980	T. Waku	448209		
apo			Japan	Gunnma Pref.	Kiryuu-shi, Tenjin	Jul. 4	1982	T. Nakaike	448206		
apo			Japan	Gunnma Pref.	Kannra-gunn, shimonita-machi, Tsuchiyazawa	Jul. 20	1980	Y. Kobayashi	448199		
apo			Japan	Gunnma Pref.	Ora-gunn, Itakura-machi, Ebizemine	Jul. 12	1983	S. Waku	446716		
apo			Japan	Gunnma Pref.	Agatsuma-gunn, Agatsuma-machi	Aug. 20	1969	K. Masuda	250384		
apo			Japan	Gunnma Pref.	Takasaki-shi, Mt. Kannonn	Nov. 7	1966	M. Kurihara	172881		
apo			Japan	Gunnma Pref.	Maebashi-shi	Sep. 14	1961	T. Tanaka	146733		
apo			Japan	Gunnma Pref.	Tone-gunn, Azuma-mura	Jul. 13	1955	T. Wakana	128406		
apo			Japan	Gunnma Pref.	Kozuke-mura, Mt. Suwa	Oct. 20	1985	T. Iwata	01026250		
apo			Japan	Gunnma Pref.	Seta-gunn, Kurohone-cho, Syukumeguri	Oct. 15	1983	S. Waku	446914		
apo			Japan	Gunnma Pref.	Seta-gunn, Azuma-mura	Oct. 15	1983	S. Waku	446913		
apo			Japan	Gunnma Pref.	Seta-gunn, Azuma-mura	Sep. 16	1983	S. Waku	446912		
apo			Japan	Gunnma Pref.	Kiryuu-shi, Hirosawa-cho	Jul. 19	1983	S. Waku	446911		
apo			Japan	Gunnma Pref.	Koudukeichinomiya	Jul. 14	1968	Yukio Jotaui	815296		
apo			Japan	Gunnma Pref.	Koudukeichinomiya	Jul. 14	1968	Yukio Jotaui	815297		
apo			Japan	Gunnma Pref.	Takasaki-shi, Mt. Kannonn	Oct. 9	1962	Yukio Jotaui	815304		
apo			Japan	Gunnma Pref.	Fujioka-shi	Sep. 7	1902	T. Makino		114409	
apo			Japan	Gunnma Pref.	Kannra-gunn, Shimonita-machi, Yashiki	Aug. 6	1984	N. Kato		284574	
apo			Japan	Gunnma Pref.	Ikahoonnsenn	Oct. 11	1957	M. Mizushima		2388	
apo			Japan	Gunnma Pref.	Agatsuma-gunn, Agatsuma-machi	Oct. 27	1969	K. Masuda		331202	
apo			Japan	Gunnma Pref.	Maebashi-shi, Taguchi-machi	Sep. 28	1957	M. Tobe		352123	
apo			Japan	Hiroshima Pref.	Hutami-gunn, Funo-sonn	Oct. 17	1981	A. Minami	557694		
apo			Japan	Hiroshima Pref.	Takata-gunn, Yoshida-machi	Oct. 17	1981	A. Minami	557709		
apo			Japan	Hiroshima Pref.	Hiba-gunn, Tojo-cho, Kushiro	Jul. 20	1975	T. Takeda	1207591		
apo			Japan	Hiroshima Pref.	Futami-gunn, Huno-mura	Oct. 17	1981	A. Minami	444499		
apo			Japan	Hiroshima Pref.	Hiba-gunn, Tojo-cho, Taishaku	Oct. 10	1982	A. Minami	1207589		
apo			Japan	Hiroshima Pref.	Hiba-gunn, Tojo-cho, Moriwaki	Jul. 26	1977	T. Takeda	519365		
apo			Japan	Hiroshima Pref.	Tsutsuga-mura, Tanojiri	Oct. 22	1977	T. Takeda	519364		
apo			Japan	Hiroshima Pref.	Hiroshima-shi, Takahi-cho, Kamihukawa	Jul. 27	1976	T. Takeda	519376		
apo			Japan	Hiroshima Pref.	Saeki-gunn, Yuki-cho	Sep. 10	1974	T. Takeda	519374		
apo			Japan	Hiroshima Pref.	Futami-gunn, Kisa-cho	Sep. 6	1975	T. Takeda	519373		
apo			Japan	Hiroshima Pref.	Saeki-gunn, Saeki-cho	Dec. 4	1976	T. Takeda	519379		
apo			Japan	Hiroshima Pref.	Fukuyama-shi, Gobun-cho	May. 1	1976	T. Takeda	521115		
apo			Japan	Hiroshima Pref.	Yamagata-gunn, Chiyoda-machi	Sep. 15	1981	M. Matsumura	519100		
apo			Japan	Hiroshima Pref.	Kure-shi, Hiro-machi, Kosemari	Nov. 15	1979	T. Takeda	519355		
apo			Japan	Hiroshima Pref.	Kamo-gunn, Yamato-machi	Oct. 31	1977	T. Takeda	519360		
apo			Japan	Hiroshima Pref.	Hukayasu-gunn, Kamichika-machi	Nov. 9	1976	T. Takeda	519366		
apo			Japan	Hiroshima Pref.	Hiba-gunn, Saijo-cho	Sep. 9	1978	T. Takeda	521145		
apo			Japan	Hiroshima Pref.	Fukuyama-shi, Yamano-cho	Oct. 14	1975	T. Takeda	521151		
apo			Japan	Hiroshima Pref.	Futami-gunn Kisa-cho	Jul. 15	1975	T. Takeda	521137		
apo			Japan	Hiroshima Pref.	Fukuyama-shi, Tsunogo-cho	Oct. 24	1977	T. Takeda	521135		
apo			Japan	Hiroshima Pref.	Fuchu-shi, Oguni	Sep. 10	1975	T. Takeda	521129		
apo			Japan	Hiroshima Pref.	Jinseki-gunn, Sanwa-cho, Age	Sep. 5	1975	T. Takeda	521126		
apo			Japan	Hiroshima Pref.	Miyoshi-shi, Uekawadate	Sep. 20	1975	T. Takeda	521131		
apo			Japan	Hiroshima Pref.	Ymagata-gunn, Geihoku-cho, Miyama	Aug. 3	1976	T. Takeda	521132		
apo			Japan	Hiroshima Pref.	Yamagata-gunn, Toyohira-cho, Shijibara	Aug. 8	1976	T. Takeda	521133		
apo			Japan	Hiroshima Pref.	Futami-gunn, Kimita-sonn, Myogadani	Aug. 29	1975	T. Takeda	521122		
apo			Japan	Hiroshima Pref.	Ashina-gunn, Shinichi-cho, Kawaidani	Aug. 9	1974	T. Takeda	521121		
apo			Japan	Hiroshima Pref.	Jinseki-gunn, Yki-cho	Jul. 28	1975	T. Takeda	521119		
apo			Japan	Hiroshima Pref.	Higashihiroshima-shi, Minaga pass	Oct. 16	1977	T. Takeda	521150		
apo			Japan	Hiroshima Pref.	Saeki-gunn, Yuki-cho	Aug. 10	1981	M. Matsumura	430815		
apo			Japan	Hiroshima Pref.	Yamagata-gun, Toyohira-cho, Nishimune	Sep. 23	1979	M. Matsumura	430817		

APPENDIX 1. Continued.

sex/ apo	DNA amounts (pg.)	Ploidy level	Locality			Date	Year	Coll.	Specimen no.		
			Country	County, Prefecture	Towns, villages, mountains				TNS	MAK	Personal no.
apo			Japan	Hiroshima Pref.	Saeki-gunn, Okimi-cho	Sep. 15	1980	M. Matsumura	430818		
apo			Japan	Hiroshima Pref.	Jinnseki-gunn, Jinseki-cho, Noya	Aug. 3	1975	T. Takeda	521140		
apo			Japan	Hiroshima Pref.	Hiroshima-shi, Kabe-machi	Sep. 4	1978	T. Takeda	521143		
apo			Japan	Hyogo Pref.	Mt. Fukuchimuro	Jul. 20	1928	Z. Tashiro	35383		
apo			Japan	Hyogo Pref.	Shiso-gunn, Hagacho, Onzui	Aug. 21	1965	T. Shiraiwa	458094		
apo			Japan	Hyogo Pref.	Asako-gunn, Itako-cho, Tochihara	Aug. 10	1966	T. Shiraiwa	458097		
apo			Japan	Hyogo Pref.	Taki-gunn, Sasayama-cho, Hiuchiwan	Oct. 25	1976	T. Shiraiwa	458095		
apo			Japan	Hyogo Pref.	Mt. Kogane	Oct. 24	1954	K. Iwasaki		27107	
apo			Japan	Ibaraki Pref.	Kuji-gunn, Satomi-mura, Okami	Aug. 20	1972	Y. nakagi	528024		
apo			Japan	Ibaraki Pref.	Hitachiota-shi, Inagi-cho	Oct. 5	1974	Y. nakagi	528025		
apo			Japan	Ibaraki Pref.	Mt. Tsukuba	Jul. 27	1979	Y. nakagi	528026		
apo			Japan	Ibaraki Pref.	Mt. Tsukuba	Aug. 19	1979	Y. Koike	528090		
apo			Japan	Ibaraki Pref.	Kuji-gunn, Mt. Nabeashi	Jul. 29	1978	M. yasu	528104		
apo			Japan	Ibaraki Pref.	Namegata-gunn, Ushibori-cho, Nagayama	Oct. 17	1977	M. Tanaya	528105		
apo			Japan	Ibaraki Pref.	Daigo-cho, Mt. Hanagame	Jul. 29	1979	M. yasu	528021		
apo			Japan	Ibaraki Pref.	Takahagi-shi, Tashiro	Jul. 21	1974	M. yasu	528022		
apo			Japan	Ibaraki Pref.	Kitaibaraki-shi, Azukibata	Jul. 29	1987	N.Nakato	01162677		
apo			Japan	Ibaraki Pref.	Mt. Tsukuba		1923	T. Makino		110518	
apo			Japan	Ishikawa Pref.	Hosu-gunn, Anamizu-machi, Nonami	Oct. 12	1978	S. Komaki	552474		
apo			Japan	Ishikawa Pref.	Kaga-shi, Tsurugataki	Sep. 8	1996	J. Hayashi		338086	
apo			Japan	Iwate Pref.	Raga, Tanohata-mura	Sep. 29	1967	M.Kikuchi	176997		
apo			Japan	Iwate Pref.	Naraiga,Tonohatamura	Sep. 28	1967	M.Kikuchi	176810		
apo			Japan	Iwate Pref.	Sennmaya-cho, Nagahashi-Shirabata	Jul. 25	1980	T. Waku	558446		
apo			Japan	Iwate Pref.	Miyako-shi, Jodogahama	Sep. 17	1977	T. Waku	558447		
apo			Japan	Iwate Pref.	Isawa-cho, Minamitsuda, Keshozaka	Aug. 12	1980	M. Suzuki	558448		
apo			Japan	Iwate Pref.	Kamaishi-shi, Shimoarakawa	Jul. 28	1980	K. Takahashi	558438		
apo			Japan	Iwate Pref.	Ohunato-shi, Yonesakishindenn	Jul. 28	1980	Z. kaneda	558435		
apo			Japan	Iwate Pref.	Shimohei-gunn, Tanohata-mura, Kiriushi	Oct. 11	1981	Y. Oda	558443		
apo			Japan	Iwate Pref.	Ichinoseki-shi, Hanaizumi-cho, Kazawa	Aug. 22	1979	M. Suzuki	558357		
apo			Japan	Iwate Pref.	Shimohei-gunn, Iwaizumi-ch0, Akka	Sep. 18	1982	M. Neichi	558358		
apo			Japan	Iwate Pref.	Rikuzentakata-shi, Hirota-cho	Aug. 5	1969	K. Inoue	558429		
apo			Japan	Iwate Pref.	Miyako-shi	Aug. 1	1950	H. Okuyama	123660		
apo			Korea	Jeju-do.		Aug. 30	1947	Chung In-Cho	151224		
apo			China	Jiangxi prov.	Lushan, Da Yue Shan,	Sep. 30	1983	K.Yao	815322		
apo			Japan	Kagawa Pref.	Kawaga-gunn, Shionoe-cho, Kaminishi	Oct. 18	1993	S. Mitani	519816		
apo			Japan	Kagawa Pref.	Nakatado-gunn, Kotonan-cho, Myojin	Jun. 27	1975	S. Mitani	519821		
apo			Japan	Kagawa Pref.	Kida-gunn, Miki-machi	Sep. 5	1976	S. Mitani	519817		
apo			Japan	Kagoshima Pref.	Mt. Kaimon	Jul. 24	1916	Z. Tashiro	23350		
apo			Japan	Kanagawa Pref.	Kawasaki-shi, Takatsu-ku	Oct. 10	1981	A. Yamamoto	493539		
apo			Japan	Kanagawa Pref.	Tsukui-gunn, Tsukui-cho, Nishinono	Aug. 5	1979	Y. Kobayashi	493540		
apo			Japan	Kanagawa Pref.	Yokohama-shi, Kanagawaku, Nishiterao	Jul. 10	1982	E. Fukushi	493537		
apo			Japan	Kanagawa Pref.	Odawara-shi, Hunabara	Sep. 5	1982	K. Tanaka	493528		
apo			Japan	Kanagawa Pref.	Hakone	Aug. 10	1962	N. Iida	493531		
apo			Japan	Kanagawa Pref.	Kasaki-shi, Aso-ku	Jun. 14	1967	T. Nakaike		335706	
apo			Japan	Kochi Pref.	Nagaoka-gunn, Ootoyo-cho, Kajigamori	Nov. 20	1966	Y. Yamamoto	451253		
apo			Japan	Kochi Pref.	Takaoka-gunn, Higashitsuno-mura, Shindenn	Aug. 28	1978	K. Yamaoka	451562		
apo			Japan	Kochi Pref.	Umaji-mura, Yanase	Aug. 23	1980	T. Iwano	451561		
apo			Japan	Kochi Pref.	Agawa-gunn, Ikegawa-cho, Yasui valley	Jul. 28	1979	T. Miyazaki	451563		
apo			Japan	Kochi Pref.	Takaoka-gunn, Sakawa-machi	Aug. 17	1887	T. Makino		144515	
apo			Japan	Kumamoto Pref.	Aso-gunn, Oguni-machi, Okuyama	Aug. 13	1977	S. Tsutsui	574045		14615
apo			Japan	Kumamoto Pref.	Aso-gunn, Oguni-machi, Seiwa	Aug. 6	1978	J. Beppu	1204984		8530
apo			Japan	Kumamoto Pref.	Minamata-shi, Mt. Yajiro	Sep. 11	1977	M. Shiroto	1204983		13072
apo			Japan	Kumamoto Pref.	Minamata-shi, Kukinookawa	Nov. 15	1964	M. Shiroto	1204982		6478
apo			Japan	Kyoto-fu.	Amata-gunn, Miwa-cho, Ubara	Jul. 26	1981	N. Yoshikawa	538126		
apo			Japan	Kyoto-fu.	Kyoto-shi, Kita-ku, Hankokudakayama	Sep. 15	1977	N. Yoshikawa	538127		
apo			Japan	Kyoto-fu.	Sakyo-ku, Hirogawarasyakuya-cho	Jul. 3	1982	Y. Kimizuka	538128		
apo			Japan	Kyoto-fu.	Hiyoshi-machi, Kisumi	Aug. 13	1982	T. Madokoro	538131		
apo			Japan	Kyoto-fu.	Kitaguwada-gunn, Hosono-mura		1935	Y. Araki		77592	
apo			Japan	Mie Pref.	Nabari-shi, Kamimitani	Sep. 9	1980	S. Yamauchi	448398		
apo			Japan	Mie Pref.	Kumano-shi, Asuka-cho	Jul. 26	1981	K. Ohora	448394		
apo			Japan	Mie Pref.	Isshi-gunn, Misugi-mura	Aug. 18	1962	Y. Higuchi	448416		
apo			Japan	Mie Pref.	Ureshino-cho, Hikawa	Nov. 24	1980	S. Yamauchi	448397		
apo			Japan	Mie Pref.	Misato-mura, Hinata	Nov. 2	1983	S. Yamauchi	449920		
apo			Japan	Miyagi Pref.	Kurokawa-gunn, Taiwa-cho, Kozurusawa	Aug. 25	1979	N. Sakawa	1207585		
apo			Japan	Miyagi Pref.	Naruse-cho, Miyatotsukihama	Oct. 22	1983	O. Asano	589577		
apo			Japan	Miyagi Pref.	Shibata-cho	Sep. 23	1982	K. Shoji	512548		
apo			Japan	Miyagi Pref.	Sendai-shi, Mt. Dainenji	Sep. 5	1982	O. Asano	512550		
apo			Japan	Miyagi Pref.	Natori-shi, Tategoshi	Jul. 10	1982	K. Shoji	512545		
apo			Japan	Miyagi Pref.	Tajiri-cho, Mt. Kagobo	Aug. 14	1975	Y. Ueno	512219		
apo			Japan	Miyagi Pref.	Kanann-cho, Wabuchi-yama	Aug. 24	1975	Y. Ueno	512215		
apo			Japan	Miyagi Pref.	Naruse-cho, Ushiami pond	Aug. 7	1982	O. Asano	512214		
apo			Japan	Miyagi Pref.	Kurihara-gunn, Kurikoma-cho	Jul. 10	1982	M. Takeichi	512225		
apo			Japan	Miyagi Pref.	Matsushima-cho, Mt. Atago	Jul. 12	1972	K. Takahashi	512380		
apo			Japan	Miyagi Pref.	Ishinomaki-shi, Tashirojima	Sep. 23	1972	K. Takahashi	512381		
apo			Japan	Miyagi Pref.	Oga-machi, Mt. Kinka	Aug. 25	1974	K. Takahashi	512540		
apo			Japan	Miyagi Pref.	Miyagi-machi, Kumagane	Aug. 13	1981	K. Shoji	512544		
apo			Japan	Miyagi Pref.	Sndaishi, Mt. Sabo	Aug. 4	1982	K. Shoji	512543		
apo	19.5	3x	Japan	Miyagi Pref.	Nobeokashi, Kitagawa-cho, Kawachimyo	Jun. 18	2013	K. Hori		410317	Dpaci 813
apo			Japan	Miyazaki Pref.	Higashiusuki-gunn, Togo-cho, Chigoarai	Sep. 5	1982	T. Minamitani	592049		32446
apo			Japan	Miyazaki Pref.	Koyu-gunn	Jul. 24	1978	T. Kariyazaki	1207593		
apo			Japan	Miyazaki Pref.	Nishiusuki-gunn, Takachiho-machi, Toroku	Oct. 16	1982	T. Minamitani	592040		33334
apo			Japan	Miyazaki Pref.	Nishiusuki-gunn, Hinoakge-machi, Oikawa	Oct. 15	1982	T. Minamitani	592043		33411
apo			Japan	Miyazaki Pref.	Higashiusuki-gunn, Saigo-mura, Mt. Shimizudake	Sep. 22	1968	T. Minamitani	592046		1282
apo			Japan	Miyazaki Pref.	Koyu-gunn, Tono-machi, Seiyabara	Sep. 20	1982	T. Minamitani	592048		32866
apo			Japan	Nagano Pref.	Nagano-shi,Hoshina	Aug. 22	1988	M. Minemura	1204952		12
apo			Japan	Nagano Pref.	Karuizawa-machi, Mt. Hanare	Sep. 10	1986	Y. Kimizuka	1204948		
apo			Japan	Nagano Pref.	Nagano-shi, shinko-machi, Hinota	Aug. 18	1959	M. Minemura	1204934		
apo			Japan	Nagano Pref.	Neba-mura, Hibara	Oct. 17	1982	H. Tsutsumi	1204933		
apo			Japan	Nagano Pref.	Sakaki-machi, Shinchi	Aug. 5	1982	H. Tsutsumi	1204932		
apo			Japan	Nagano Pref.	Matsumoto-shi	Jul. 22	1981	H. Okubara	1204931		
apo			Japan	Nagano Pref.	Iida-shi, Chiyono pond	Jul. 23	1981	H. Tsutsumi	712208		
apo			Japan	Nagano Pref.	Miho-mura	Aug. 22	1955	M. Matsumura	126635		
apo			Japan	Nagano Pref.	Fukushima-cho, Chigono	Aug. 29	1981	H. Tsutsumi	421326		
apo			Japan	Nagano Pref.	Saku-shi, Uchiyama pass	Sep. 24	1981	H. Tsutsumi	421329		
apo			Japan	Nagano Pref.	Minamikiso-machi, Sakamotodaira	Aug. 25	1981	H. Tsutsumi	421328		
apo			Japan	Nagano Pref.	Anan-cho, Minamisawa	Oct. 10	1981	H. Tsutsumi	421327		
apo			Japan	Nagano Pref.	Saku-machi, Yoji	Sep. 23	1981	H. Tsutsumi	420701		
apo			Japan	Nagano Pref.	Oguwa-mura	Aug. 24	1981	H. Tsutsumi	421314		
apo			Japan	Nagano Pref.	Kamimatsu-cho	Aug. 26	1981	H. Tsutsumi	421323		
apo			Japan	Nagano Pref.	Oguwa-mura	Oct. 27	1981	H. Tsutsumi	421322		
apo			Japan	Nagano Pref.	Naganao-shi, Murayama	Aug. 22	1981	H. Tsutsumi	421320		
apo			Japan	Nagano Pref.	Neba-mura	Oct. 22	1981	H. Tsutsumi	421310		
apo			Japan	Nagano Pref.	Omachi-shi	Jul.	1930	T. Makino		290443	
apo			Japan	Nagano Pref.	Shimoina-gunn, Takamori-cho	Aug. 6	1991	K. Asano		378490	
apo			Japan	Nagano Pref.	Shimoina-gunn, Matsukawa-cho, Seisnchi	Nov. 14	1993	K. Asano		341863	
apo			Japan	Nagano Pref.	Iida-shi, Tatsuoka, Suzuoka park	Jun. 11	2002	A. Yamamoto		391349	
apo			Japan	Nagano Pref.	Karuizawa-machi, Mt. Hanare	Aug. 10	1938	A. Yamamoto		296045	
apo			Japan	Nagano Pref.	Shimoina-gunn, Tenryuu-mura, Shimizu	Apr. 2	1992	K. Asano		386036	

APPENDIX 1. Continued.

sex/ apo	DNA amounts (pg.)	Ploidy level	Locality			Date	Year	Coll.	Specimen no.		
			Country	County, Prefecture	Towns, villages, mountains				TNS	MAK	Personal no.
apo			Japan	Nagasaki Pref.	Tsushima-shi, uehara-machi, Mt. Mitake	Aug. 14	1974	B. Matsumura	574885		
apo			Japan	Nagasaki Pref.	Tsushima-shi, shimoagata-gunn, Mitsushima-cho	Sep. 24	1972	S. Kobayashi	573446		2805
apo			Japan	Nagasaki Pref.	Tsushima-shi, Kamiagata-machi, Mt. Mitake	Jul. 19	1979	S. Tsutsui	573451		17376
apo			Japan	Nara Pref.	Gosho-shi, Kongousann	Aug. 16	1976	Y. Inoue	511746		
apo			Japan	Nara Pref.	Nara-shi, Minamisho-machi	Aug. 21	1977	Y. Tsujimoto	511749		
apo			Japan	Nara Pref.	Sakurai-shi	Sep. 6	1981	Y. Tsujimoto	511751		
apo			Japan	Niigata Pref.	Kamoshi, Iwano	Jul. 11	1981	T. Takahashi	596930		
apo			Japan	Niigata Pref.	Aomi-cho, Ueji	Aug. 28	1982	T. Takahashi	596931		
apo			Japan	Niigata Pref.	Sado-gunn, Aikawa-cho, Iwayaguchi	Jul. 7	1988	N. Tanaka	1204953		
apo			Japan	Oita Pref.	Kusu-gunn, Kusu-machi, Yamaura	Aug.	1952	M. Hadno	1204981		
apo			Japan	Oita Pref.	Shimoge-gunn, Yamakuni-machi	Aug. 7	1982	Y. Takaoka	1204954		FOP-P4894
apo			Japan	Oita Pref.	Kusu-gun, Kusu-machi, Mt. Hane	Sep. 24	1973	M. Arakane	1204979		FOP-P6227
apo			Japan	Oita Pref.	Usa-shi, Mt. Omoto	Aug. 3	1978	Y. Takaoka	1204980		FOP-P1940
apo			Japan	Oita Pref.	Nishikunisaki-gunn, Matama-machi	Aug. 18	1978	Y. Takaoka	1204977		FOP-P1712
apo			Japan	Okayama Pref.	Tsuyama-shi, Higashiichinomiya	Aug. 21	1985	Y. Obata	1204945		
apo			Japan	Okayama Pref.	Aida-gunn, Nishiawakura-mura, Mt. Kiji	Aug. 24	1984	Y. Obata	1204942		
apo			Japan	Okayama Pref.	Kawakami-gunn, Bicchu-machi	Aug. 17	1965	I. Akasawa	01092536		
apo			Japan	Okayama Pref.	Ihara-shi, Kinogo-machi	Nov. 9	1982	Y. Obata	01161653		
apo			Japan	Okayama Pref.	Aida-gunn, Mimasaka-cho	Sep. 16	1982	Y. Obata	01161656		
apo			Japan	Okayama Pref.	Jobo-gunn, Ukann-cho, Kamiukann	Oct. 9	1982	Y. Obata	01161652		
apo			Japan	Okayama Pref.	Atetsu-gunn, Osa-cho, Kamiosakabe	Sep. 18	1976	T. Watanabe	523310		
apo			Japan	Okayama Pref.	Katsuta-gunn, Shoboku-cho, Yamagata	Aug. 25	1976	K. Takayama	523331		
apo			Japan	Okayama Pref.	Jobo-gunn, Kayo-cho, Yoshikawa	Oct. 27	1980	Y. Obata	523333		
apo			Japan	Okayama Pref.	Atetsu-gunn, Tetsuta-cho	Nov. 5	1975	T. Watanabe	334550		
apo			Japan	Okayama Pref.	Kawakami-gunn, Nariwa-cho, Sakamoto	Sep. 17	1975	T. Watanabe	334517		
apo			Japan	Okayama Pref.	Mitsu-gunn, Takebe-cho	Nov. 2	1980	T. Saito	523339		
apo			Japan	Okayama Pref.	Oiwa	Sep. 9	1979	T. Saito	523298		
apo			Japan	Okayama Pref.	Tsukubo-gunn, Kiyone-sonn, Karube	Nov. 13	1981	Y. Obata	523303		
apo			Japan	Okayama Pref.	Kume-gunn, Kumenan-cho, Yuge	Nov. 12	1981	Y. Obata	523304		
apo			Japan	Okayama Pref.	Niimi-shi, Miyanohana	Jun. 27	1982	Y. Obata	523328		
apo			Japan	Okayama Pref.	Kayo-cho, Oiwa	Oct. 27	1980	Y. Obata	523329		
apo			Japan	Okayama Pref.	Kyo-cho, Jinnbara	Oct. 27	1980	Y. Obata	523332		
apo			Japan	Okayama Pref.	Kibi-gunn, Syowa-machi	Aug. 30	1932	T. Makino		112929	
apo			Japan	Osaka-fu.	Toyono-gunn, Noza-machi, Shimoda	Sep. 27	1981	A. Komaki	527959		
apo			Japan	Saga Pref.	Saga-gunn, Fuji-machi, Mt. Ibara	Aug. 19	1979	M. Sdatamatsu	500705		
apo			Japan	Saga Pref.	Higashimatsura-gunn, Nananayama-mura	Jul. 17	1976	Y. Kuranari	501292		
apo			Japan	Saga Pref.	Higashimatsura-gunn, Ouchi-cho	Nov. 8	1975	Y. Kuranari	501291		
apo			Japan	Saga Pref.	Imari-shi, Higashiyamashiro-machi	Jul. 23	1975	Y. Kuranari	501289		
apo			Japan	Saga Pref.	Kannzaki-gunn, Higashisefuri-mura	Sep. 1	1968	S. Tsutsui	448013		6149
apo			Japan	Saga Pref.	Nishimatsura-gunn, Nishiarita-machi	Aug. 18	1978	M. Iwamura	544903		
apo			Japan	Saga Pref.	Mt. Kaminari	Aug. 24	1973	K. Suzuki		267119	
apo			Japan	Saitama Pref.	Omiya-shi, Kiyokawadera	Nov. 21	1981	M. Shimosegawa	448035		
apo			Japan	Saitama Pref.	Hasuda-shi, Magome	Nov. 13	1982	M. Shimosegawa	448036		
apo			Japan	Saitama Pref.	Sayama-shi, Kashiwabara	Jun. 12	1983	M. Shimosegawa	442541		
apo			Japan	Saitama Pref.	Chichibu-gunn, Ryokami-mura	Nov. 21	1982	S. Kobayashi	935761		
apo			Japan	Saitama Pref.	Chichibu-gunn, Higashichichibu-mura	Sep. 20	1982	M. Shimosegawa	935772		
apo			Japan	Saitama Pref.	Ogawa-machi	Nov. 21	1982	S. Kobayashi	935773		
apo			Japan	Saitama Pref.	Otaki-mura, Nakasouri	Aug. 17	1982	M. Shimosegawa	935771		
apo			Japan	Saitama Pref.	Hannou-shi, Iwabuchi	Oct. 9	1982	S. Kobayashi	935770		
apo			Japan	Saitama Pref.	Urawashi, Misono	Jul. 12	1980	T. Waku	935780		
apo			Japan	Saitama Pref.	Siraoka-machi, Minamishinjuku	Nov. 8	1982	M. Shimosegawa	935774		
apo			Japan	Saitama Pref.	Honjo-shi, Okuboyama	Jul. 13	1980	K. Mashita	935785		
apo			Japan	Saitama Pref.	Otaki-mura, Mt. Mitake	Sep. 8	1966	T. Iwata	01139451		
apo			Japan	Saitama Pref.	Ryokami-mura	Oct. 3	2006	T. Iwata	01139469		
apo			Japan	Saitama Pref.	Hannou-shi, Mt. Tenrann	Nov. 8	2000	T. Iwata	01139464		
apo			Japan	Saitama Pref.	Ogose-machi, Mt. Otakadori	Jul. 19	1997	T. Iwata	01139454		
apo			Japan	Saitama Pref.	Yoshida-machi, Mt. Shiromine	Oct. 18	1996	T. Iwata	01139447		
apo			Japan	Saitama Pref.	Minano-machi	Oct. 24	1996	T. Iwata	01139446		
apo			Japan	Saitama Pref.	Chichibu-shi, Urayama	Oct. 31	1993	T. Iwata	01139427		
apo			Japan	Saitama Pref.	Ogano-machi, Ushikubi pass	Oct. 11	1993	T. Iwata	01139246		
apo			Japan	Saitama Pref.	Ryokami-mura, Mt. Ryokami	Sep. 25	1993	T. Iwata	01139425		
apo			Japan	Saitama Pref.	Nagatoro-machi, Otsuki pass	Oct. 9	1988	T. Iwata	01139409		
apo			Japan	Saitama Pref.	Otaki-mura, Misoba	Jul. 11	1990	T. Iwata	01139403		
apo			Japan	Saitama Pref.	Arakawa-mura, Saginosu	Jul. 31	1991	T. Iwata	01139394		
apo			Japan	Saitama Pref.	Sayama hill	Oct. 15	1961	M. Satake	156159		
apo			Japan	Saitama Pref.	Urawa-shi, Daimon	Oct. 10	1968	Tetsuya kawasaki	675366		
apo			Japan	Saitama Pref.	Urawa-shi, Oyaguchi	Oct. 26	1968	Tetsuya kawasaki	675867		
apo			Japan	Saitama Pref.	Iruma-gunn, Hidaka-cho	Sep. 8	1946	Tetsuya kawasaki	676562		
apo			Japan	Saitama Pref.	Nagatoro-machi, Mt. Iwane	Jul. 23	1984	T. Iwata	01026276		
apo			Japan	Saitama Pref.	Nagatoro-machi, Mt. Iwane	Jul. 23	1984	T. Iwata	01026277		
apo			Japan	Saitama Pref.	Nagatoro-machi, Mt. Jinmi	Aug. 15	1984	T. Iwata	01026275		
apo			Japan	Saitama Pref.	Naguri-mura, Hitomiiri	Oct. 19	1984	T. Iwata	01026268		
apo			Japan	Saitama Pref.	Hannou-shi, Koshu	Nov. 10	1984	T. Iwata	01026265		
apo			Japan	Saitama Pref.	Nagatoro-machi, Huubu	Aug. 31	1988	T. Iwata	01026255		
apo			Japan	Saitama Pref.	Yorii-machi, Kamabuse	Nov. 1	1985	T. Iwata	01026251		
apo			Japan	Saitama Pref.	Yorii-machi, Kamabuse	Nov. 1	1985	T. Iwata	01026248		
apo			Japan	Saitama Pref.	Yokoza-machi, Ikukawa	Aug. 23	1987	T. Iwata	01026229		
apo			Japan	Saitama Pref.	Chichibu-shi, Okagura	Sep. 1	1987	T. Iwata	01026227		
apo			Japan	Saitama Pref.	Chichibu-shi, Tochiya	Nov. 17	1987	T. Iwata	01026221		
apo			Japan	Saitama Pref.	Osato-mura, Yoshioka	Oct. 29	1983	M. Shimosegawa	538328		
apo			Japan	Saitama Pref.	Kamiizumi-mura, Mukoudaira	Nov. 14	1983	S. Ojima	446859		
apo			Japan	Saitama Pref.	Syomaru pass	Aug. 30	1992	T. Yamada	739143		
apo			Japan	Saitama Pref.	Hiki-gunn, Ogose-machi, Mt. Kuro	Jul. 4	1971	T. Iwata	01026308		
apo			Japan	Saitama Pref.	Chichibu-gunn, Ykoze-mura, Mt. Futago	Sep. 13	1982	T. Iwata	01026296		
apo			Japan	Saitama Pref.	Chichibu-shi, Tsunakubotani	Aug. 7	1983	T. Iwata	01026285		
apo			Japan	Saitama Pref.	Iruma-shi, Ogose-machi, Mt. Kuro	Nov.	1970	K. Suzuki		262834	
apo			Japan	Saitama Pref.	Iruma-gunn, Mt. Monomi	Sep. 18	1938	A. Yamamoto		312865	
apo			Japan	Saitama Pref.	Hannno-shi	Jun. 25	1967	K. Suzuki		262333	
apo			Japan	Shiga Pref.	Shiga-gunn, Shiga-machi, Minamihira	Sep. 24	1977	T. Waku	443304		
apo			Japan	Shiga Pref.	Mt. Hira	Nov. 7	1944	T. Hashimoto	101543		
apo			Japan	Shiga Pref.	Kouga-gunn, Kouka-cho, Aburahi	Jan. 10	1977	S.Okamoto	213923		
apo			Japan	Shiga Pref.	Otsu-shi, Mt. Hiei	Sep. 7	1975	K. Suzuki		270091	
apo			Japan	Shimane Pref.	Ochi-gunn, Mizuho-cho	Oct. 17	1976	M. Matsumura	443779		
apo			Japan	Shimane Pref.	Izumo-shi, Tatsukuekyo	Aug. 27	1977	H. Yamamoto	445064		
apo			Japan	Shimane Pref.	Iishi-gunn, Tonnbara-co, Mt. Kotohiki	Aug. 3	1978	H. Yamamoto	445063		
apo			Japan	Shimane Pref.	Ota-shi, Mt. Sannbe, Himenoga pond	Aug. 10	1980	Gakuson Imada	448663		
apo			Japan	Shizuoka Pref.	Ohito-cho, Chojabara	Jul. 31	1987	T. Hosokura	1204941		
apo			Japan	Shizuoka Pref.	Fujinomiya-shi	Sep. 18	1983	T. Sato	445204		
apo			Japan	Shizuoka Pref.	Gotenba-shi, Innno	Sep. 19	1983	T. Hosokura	445205		
apo			Japan	Shizuoka Pref.	Mt. Amagi	Nov. 19	1943	H. Okuyama	893709		
apo			Japan	Shizuoka Pref.	Fujinomiya-shi, Mt. Kenashi	Sep. 4	1979	Y. Sakuma	820702		
apo			Japan	Shizuoka Pref.	Fujinomiya-shi, Mt. Kenashi	Aug. 8	1979	Y. Sakuma	820230		
apo			Japan	Shizuoka Pref.	Fuji-shi, Maruhi	Jul. 30	1982	H. Suzuki	1204956		
apo			Japan	Shizuoka Pref.	Fuji-shi, Maruhi	Jul. 30	1982	H. Suzuki	1204955		
apo			Japan	Shizuoka Pref.	Amagiyogashima-cho, Nekogoe pass	Oct. 23	1977	A. Suzuki	510638		
apo			Japan	Shizuoka Pref.	Hamakita-shi, Miyaguchi	Oct. 15	1980	T. Sato	510367		
apo			Japan	Shizuoka Pref.	Shizoka-shi, Ikawa	Sep. 7	1982	H. Suzuki	510636		
apo			Japan	Shizuoka Pref.	Iwata-gunn, Sakuma-machi, Yoshizawa	Sep. 24	1972	I. Yamashita	510361		

APPENDIX 1. Continued.

sex/ apo	DNA amounts (pg.)	Ploidy level	Locality			Date	Year	Coll.	Specimen no.		
			Country	County, Prefecture	Towns, villages, mountains				TNS	MAK	Personal no.
apo			Japan	Shizuoka Pref.	Shizuoka-shi, Makigatani	Jun. 29	1952	T. Sugino	510628		
apo			Japan	Shizuoka Pref.	Kawane-cho, Sasama	Sep. 5	1982	T. Sugino	510626		
apo			Japan	Shizuoka Pref.	Honkawane-cho	Sep. 5	1976	T. Sugino	510625		
apo			Japan	Shizuoka Pref.	Kakegawa-shi, Ishibata	Nov. 14	1982	T. Sugino	510620		
apo			Japan	Shizuoka Pref.	Hamaoka-cho	Jan. 15	1964	T. Sugino	510623		
apo			Japan	Shizuoka Pref.	Fujieda-shi, Bikuishi	Jul. 29	1981	T. Sugino	510618		
apo			Japan	Shizuoka Pref.	Haruno-cho	Sep. 9	1982	T. Sugino	510610		
apo			Japan	Shizuoka Pref.	Kakegawa-shi, Sakashita	Nov. 14	1982	T. Sugino	510616		
apo			Japan	Shizuoka Pref.	Amagiyogashima-cho	Oct. 12	1982	T. Yamamoto	510608		
apo			Japan	Shizuoka Pref.	Ito-shi, Futazuka	Sep. 27	1982	T. Yamamoto	510607		
apo			Japan	Shizuoka Pref.	Smata spa, Ohma village, Honkawane-cho	Jul. 23	1969	F. Konta	929467		
apo			Japan	Shizuoka Pref.	Fuji-shi, Tennma	Jun. 24	1986	F. Chikada	929469		
apo			Japan	Shizuoka Pref.	Iwata-gunn, Misakubo-cho	Sep. 3	1978	F. Miyamoto	83055		
apo			Japan	Shizuoka Pref.	Fuji-shi, Tennma	Jun. 24	1986	F. Chikada	623840		
apo			Japan	Shizuoka Pref.	Numazu-shi, Mt. Washizu	Jun. 29	1983	T. Hosokura	483483		
apo			Japan	Shizuoka Pref.	Fuji-shi, Sekotsuji	Aug.	1982	T. Hosokura	483486		
apo			Japan	Shizuoka Pref.	Syuuchi-gunn, Haruno-cho	Aug. 13	1973	Suzuki		280666	
apo			Japan	Shizuoka Pref.	Tennryuu-shi, Nishikashima	Jun. 17	1961	K. Satake		320631	
apo			Korea	Tadabarunann-do.	Mt. Keiryu	Sep. 10	1961	Choi Doo Man	01092546		
apo			Japan	Tochigi Pref.	Nasu-gunn, Nasu-cho, Toyohara	Aug. 22	1985	M. Usui	1204944		
apo			Japan	Tochigi Pref.	Shioya-gun, Shiobara-machi, Mt. Fuji	Aug. 15	1977	T. Waku	524048		
apo			Japan	Tochigi Pref.	Kawachi-gunn, Kaminokawa-machi, Kaminokawa	Jun. 22	1982	M. Usui	524055		
apo			Japan	Tochigi Pref.	Anndou-gunn, Shobu-cho, Miyaharamaesawa	Aug. 1	1964	K. Ogawa	524046		
apo			Japan	Tochigi Pref.	Utsunomiya-shi, Komuro	Oct. 4	1980	M. Usui	524584		
apo			Japan	Tochigi Pref.	Utsunomiya-shi, Nagaoka	Aug. 28	1980	M. Usui	524586		
apo			Japan	Tochigi Pref.	Haga-gunn, Mashiko-machi, Mt. Takadate	Oct. 16	1981	M. Usui	523846		
apo			Japan	Tochigi Pref.	Nasu-gunn, Bato-machi, Minamidaira	Sep. 16	1981	M. Usui	523848		
apo			Japan	Tochigi Pref.	Shioya-gun, Kitsuregawa-machi, Haguro	Sep. 2	1981	M. Usui	523850		
apo			Japan	Tochigi Pref.	Kanuma-shi, Kazono, Mt. Futayama	Jun. 29	1980	T. Waku	523856		
apo			Japan	Tochigi Pref.	Nasu-gunn, Nasu-machi, Iouno	Aug. 13	1980	M. Usui	523860		
apo			Japan	Tochigi Pref.	Nasu-gunn, Zuishoji	Aug. 22	1968	H. Ito	01092290		
apo			Japan	Tochigi Pref.	Nikko-shi, Yamakubonumata	Aug. 9	1987	T. Kamiyama	00799433		
apo			Japan	Tochigi Pref.	Imaichi-shi, Mt. Omuromae	Jul. 25	1985	T. Noguchi	00799427		
apo			Japan	Tochigi Pref.	Nasu-gunn, Nasumachi, Yoriiokubo	Sep. 20	1983	S. Waku	446707		
apo			Japan	Tochigi Pref.	Yaita-shi, Shiota	Aug. 30	1980	T. Tashiro	524053		
apo			Japan	Tochigi Pref.	Yaita-shi, Tatsuashi	Sep. 1	1980	T. Tashiro	524045		
apo			Japan	Tokushima Pref.	Kito-sonn, Minamikawa	Jul. 25	1972	K. Abe	511076		
apo			Japan	Tokyo-to.	Setagaya-ku, Yoga	Aug. 27	1933	Mitsunoya	01017696		
apo			Japan	Tokyo-to.	Machida-shi, Zushi		1975	Misao Hemmi	441599		
apo			Japan	Tokyo-to.	Aoume-shi, Oume hill	Nov. 22	2006	S. Fujimoto	763933		
apo			Japan	Tokyo-to.	Nishitama-gunn, Okutama-machi	Jun. 6	1999	R. Minakawa	9526437		
apo			Japan	Tokyo-to.	Nishitama-gunn, Kori	Aug. 18	1972	M. Sakakibara	309691		
apo			Japan	Tokyo-to.	Itabashi-ku	Mar. 12	1963	A. Nishikawa	163590		
apo			Japan	Tokyo-to.	Toshima-gunn, Hukuro-mura	Jul. 6	1897	K. Watanabe	63275		
apo			Japan	Tokyo-to.	Okutama	Aug. 18	1957	T. Takano	134106		
apo			Japan	Tokyo-to.	Hachioji-shi, Ishikawa-cho	Aug. 20	1977	N.Nakato	01163187		
apo			Japan	Tokyo-to.	Inagi-shi, Momura	Jun. 25	2012	K. Hori		405131	
apo			Japan	Tokyo-to.	Oume-shi	Oct. 23	1984	T. Iwata	01026266		
apo			Japan	Tokyo-to.	Mt. Kumotori	Jul. 26	1978	Yoshihisa Sakuma	815288		
apo			Japan	Tokyo-to.	Kitto-san, Hinohara-mura, Nishitama-gunn	Aug. 31	1988	Kenji Inoue	815317		
apo			Japan	Tokyo-to.	Hachioji-shi, Motohachiojijoshi	Dec. 12	1976	Y. Kobayashi	524882		
apo			Japan	Tokyo-to.	Hachioji-shi, Naganuma	Aug. 2	2012	K. Hori		405220	
apo			Japan	Tokyo-to.	Nishitama-gunn, Hinohara-mura, Watamukai	Sep. 13	1980	A. Yamamoto	524881		
apo			Japan	Tokyo-to.	Nishitama-gunn, Okutama-machi	Sep. 23	1980	H. Endo	524250		
apo			Japan	Tokyo-to.	Nishitama-gunn, Okutama-machi	Aug. 12	1981	H. Endo	524249		
apo			Japan	Tokyo-to.	Okutama-machi, Nippara	Nov. 8	1958	K. Suzuki	137213		
apo			Japan	Tokyo-to.	Nerima-ku	Jun. 25	1943	T. Makino		110519	
apo			Japan	Tokyo-to.	Nerima-ku	July	1930	T. Makino		111284	
apo			Japan	Tokyo-to.	Kita-ku	Oct. 15	1914			140301	
apo			Japan	Tokyo-to.	Shibuya-ku, Hatsudai	Nov. 30	1952	S. Yano		323747	
apo			Japan	Tokyo-to.	Kita-ku	Sep. 29	1935	A. Yamamoto		296044	
apo			Japan	Tokyo-to.	Nishitama-gunn, Okutama-machi, Mt. Kawagoke	May. 1	1974	K. Suzuki		249892	
apo			Japan	Tokyo-to.	Shibuya-ku, Meijijinguumae	May. 27	1961	S. Yano		343203	
apo			Japan	Tokyo-to.	Nishitama-gunn, Okutama-machi, Nippara	May. 29	2000	A. Yamamoto		312018	
apo			Japan	Tokyo-to.	Hachioji-shi, Mt. Imaguma	Aug. 25	1991	N. Kato		284570	
apo			Japan	Tokyo-to.	Oume-shi, Hinatawada	Jun. 12	1998	J. Murata		307393	
apo			Japan	Tokyo-to.	Nishitama-gunn, hinohara-mura, Kosakashi river	Oct. 14	2000	T. Murakami		321623	
apo			Japan	Tokyo-to.	Hachioji-shi, Kobki-cho	Jul. 17	2012	F. Sakai		406228	
apo			Japan	Tokyo-to.	Higashimurayama pond	Oct. 17	1932	K. Hinoyama		352121	
apo			Japan	Tokyo-to.	Hachioji-shi, Minamiosawa	Sep. 6	1987	K. Yamaguchi		258727	
apo			Japan	Tokyo-to.	Minamitama-gunn, Takiyama hill	Oct. 16	1955	M. Mizushima		492	
apo			Japan	Tokyo-to.	Nerima-ku, Syakujii, Sanpoji pond	Oct. 20	1974	K. Suzuki		249989	
apo			Japan	Tokyo-to.	Nishitama-gunn, Okutama-machi, Suniwa river	Aug. 23	2012	K. Hori		405330	
apo			Japan	Tottori Pref.	Hino-gunn, Nichinan-cho, Oriwatari	Oct. 2	1980	M. Aoto	551270		
apo			Japan	Tottori Pref.	Ouchi-gunn, Iwami-cho, Dangyo	Oct. 17	1976	M. Matsumura	443778		
apo			Japan	Tottori Pref.	Tohaku-gunn, Misasa-cho	Dec. 20	1960	A. Tanaka	444390		
apo			Japan	Toyama Pref.	Asahi-machi, Ohira	Oct. 1	1983	T. Oshima	1204936		
apo			Japan	Toyama Pref.	Shimoshinkawa-gunn, Asahi-machi	Oct. 7	1976	T. Nakaike	1207588		
apo			Japan	Toyama Pref.	Higashitonami-gunn, Toga-mura	Oct. 30	1983	S. Komaki	449761		
apo			Japan	Toyama Pref.	Turumi-yama,Itoigawa-shi	Nov. 4	1981	H. Tomitori	572879		
apo			Japan	Wakayama	Higashimuro-gunn, Kozagawa-cho, Ichimaiiwa	Aug. 9	2012	K. Hori		405261	
apo			Japan	Wakayama	Higashimuro-gunn, Kozagawa-cho, Ichimaiiwa	Aug. 9	2012	K. Hori		405262	
apo			Japan	Wakayama Pref.	Nishimuro-gunn, Nakaheji-cho	Oct. 10	1965	H. Masa	450230		
apo			Japan	Yamagata Pref.	Tsuruoka-shi, Oyama-park	Oct. 9	1958	N. Kato	138004		
apo			Japan	Yamagata Pref.	Nannyo-shi, Nakagawa St.	Sep. 13	1981	A. Sato	1204935		1173
apo			Japan	Yamagata Pref.	Nishiokitama-gunn, Oguni-machi, Yokokawa	Aug. 17	1961	N. Kato	533212		
apo			Japan	Yamagata Pref.	Nannyo-shi, Nakagawa	Jul. 11	1980	N. Sakawa	533220		
apo			Japan	Yamagata Pref.	Nishiokitama-gunn, Oguni-machi	Aug. 18	1961	N. Kato	147688		
apo			Japan	Yamaguchi Pref.	Abu-gunn, Ato-cho	Jul. 17	1983	A. Minami	1207590		
apo			Japan	Yamaguchi Pref.	Toyoura-gunn, Toyoura-cho, Onigashiro	Jun. 28	1980	Gakuson Imada	397346		
apo			Japan	Yamanashi Pref.	Hokuto-gunn, Tabayama-mura	Aug. 6	1981	H. Endo	507337		
apo			Japan	Yamanashi Pref.	Kofu-shi, Syosenkyo	Aug. 17	1981	A. Yamamoto	507339		
apo			Japan	Yamanashi Pref.	Minamikoma-gunn, Hayakawa-cho, Toriya	Oct. 24	1981	M. Nakagawa	507341		
apo			Japan	Yamanashi Pref.	Shirasu-machi, Shiosawaonnsenn	Aug. 9	1977	T. Nakaike	507342		
apo			Japan	Yamanashi Pref.	Mt. Fuji, Aokigahara	Jan. 1	1968	J. Sugimoto	223787		
apo			Japan	Yamanashi Pref.	Minamikoma-gunn, Hayakawa-cho, Konawa	Sep. 3	1983	M. Nakagawa	586745		
apo			Japan	Yamanashi Pref.	Minamikoma-gunn, Hayakawa-cho, Kusashio	Sep. 3	1983	M. Nakagawa	586746		
apo			Japan	Yamanashi Pref.	Mt. Fuji, Aokigahara	Aug. 31	1981	F. Miyamoto	815313		
apo			Korea	Zennrahoku-do.	Mt Tokusuke	Jul. 16	1960	Choi Doo Man	1092544		
apo			Korea	Zennranann-do.	Mt. Tamaume	Aug. 22	1963	Choi Doo Man	1092547		